

DETAILED ACTION

Remarks

Applicant's request for reconsideration of the last Notice of Non-compliance Amendment, due to an Examiner's oversight part, is persuasive and; therefore, the notice to the applicant regarding the non-compliant amendment is withdrawn, and a new office action follows.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114.

Applicant's submission filed on 09/29/09 has been entered.

This communication is responsive to Amendment filed 09/29/09.

Claims 1-6, 8-15 are pending in this application. Claims 1, 2, 14 are independent claims.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be

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filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Applicant's representative, Mr. Jon D. Shutter, on December 17, 2009.

Cancel claims 3, 13

The application has been amended as follows:

Claim 1 (currently amended): A computer-implemented method of operating a navigation system, said method comprising:

using a geographic database stored on a computer readable storage medium containing data that represents geographic features, wherein said database includes a single indexing structure with three dimensions, wherein said indexing structure is a k-d tree comprising a root node, intermediate nodes and leaf nodes, wherein each node is part of a parent-child relationship wherein each parent node includes control information from which one of at least two child nodes associated with the parent node are distinguishable based on a search key, wherein a first dimension of said three dimensions includes latitude boundary information, wherein a second dimension of said three dimensions includes longitude boundary information, wherein said latitude boundary information and said longitude boundary information define a bounded area represented by a maximum latitude, a maximum longitude, a minimum latitude and a minimum longitude, wherein a third dimension of said three dimensions includes rank information,

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wherein each of said geographic features have an associated rank information, wherein said rank information has at least two levels, a first level of rank is associated with the geographic features of greater importance and a second level of rank is associated with geographic features of lesser importance,

searching said geographic database stored on the computer readable storage medium for data representing a geographic feature using a latitude value, a longitude value and a rank value, wherein said search uses said first and second dimensions of said single indexing structure to identify the bounded area in which the latitude value and longitude value falls within, wherein said search uses said third dimension of said single indexing structure to identify said level of rank corresponding to said rank value.

Claim 2 (currently amended): A computer-implemented index stored on a computer readable storage medium for a geographic database containing geographic data that represent geographic features, said index comprising:

a single index structure that includes two spatial dimensions and a non-spatial third dimension, wherein said two spatial dimensions define a bounded area represented by a maximum latitude, a maximum longitude, a minimum latitude and a minimum longitude, ~~wherein said third dimension defines scale information associated with said indexed geographic data,~~

wherein said single index structure is a *k*-d-tree index structure comprising a root node, intermediate nodes and leaf nodes, wherein each node is part of a parent-child relationship wherein each parent node includes control information

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from which one of at least two child nodes associated with the parent node are distinguishable based on a search key,

said geographic data indexed by said single index structure are searchable spatially using computer-executable instructions and said two spatial dimensions of said single index structure and a latitude and a longitude, said geographic data indexed by said single index structure are searchable for a ~~level of the scale information~~ non-spatial property of the indexed geographic data that represent the geographic features using computer-executable instructions and said third dimension of said single index structure, wherein said non-spatial property of the geographic data includes a rank associated with the geographic features represented by the geographic data, a granularity of said indexed geographic data, and a scale associated with said indexed geographic data, wherein said data that represent geographic features are organized into layers based on said rank associated with the represented features.

Claim 3 (canceled).

Claim 4 (previously presented): The invention of Claim 1 or 2 wherein said index is homogeneous.

Claim 5 (previously presented): The invention of Claim 1 or 2 wherein said index is non-homogeneous.

Claim 6 (original): The invention of Claim 1 or 2 wherein said geographic features are roads.

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Claim 7 (canceled).

Claim 8 (currently amended) The invention of Claim 1 or 2 wherein said rank includes both integers and fractional values.

Claim 9 (previously presented): The invention of Claim 14 wherein said rank includes both integers and fractional values.

Claim 10 (previously presented): The invention of Claim 14 wherein said geographic features are roads.

Claim 11 (previously presented): The invention of Claim 14 wherein said index is non-homogeneous.

Claim 12 (previously presented): The invention of Claim 14 wherein said index is homogeneous.

Claim 13 (canceled).

Claim 14 (currently amended): A computer-implemented index stored on a computer readable storage medium comprising:

a single k-d tree indexing structure that includes a first dimension, a second dimension and a third dimension, wherein said k-d-tree index structure comprising a root node, intermediate nodes and leaf nodes, wherein each node is part of a parent-child relationship wherein each parent node includes control information from which one of at least two child nodes associated with the parent node are distinguishable based on a search key.

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wherein the k-d tree indexing structure is used to index parcels of geographic data, wherein said parcels are collections of said geographic data that represent geographic features encompassed within a bounded area;

wherein said first dimension includes latitude boundary information of said bounded area,

wherein said second dimension includes longitude boundary information of said bounded area, wherein said latitude boundary information and said longitude boundary information define said bounded area represented by a maximum latitude, a maximum longitude, a minimum latitude and a minimum longitude, said parcels of geographic data indexed by said single indexing structure are searchable using computer-executable instructions and a latitude value, a longitude value and said first and second dimension of said indexing structure,

wherein said third dimension includes rank information that has at least two levels, wherein a first level of rank is associated with geographic features of greater importance and a second level of rank is associated with the geographic features of lesser importance, said data indexed by said single indexing structure is searchable for said rank using computer-executable instructions and said third dimension of said single indexing structure.

Claim 15 (previously presented): The method of Claim 1 wherein said data that represent geographic features are organized into layers based on said rank associated with the represented features.

Statement of Reasons for Allowance

Claims 1-2, 4-6, 8-12, 14-15 are allowed.

The following is an examiner's statement of reasons for allowance.

The present invention is directed to a multi-dimensional spatial index that is useful for accessing and using data in geographic database.

All independent claims 1, 2, 14 recite, or similarly recite, in combination with the remaining elements, *wherein said indexing structure is a k-d tree comprising a root node, intermediate nodes and leaf nodes, wherein each node is part of a parent-child relationship wherein each parent node includes control information from which one of at least two child nodes associated with the parent node are distinguishable based on a search key, said geographic data indexed by said single index structure are searchable spatially using computer-executable instructions and said two spatial dimensions of said single index structure and a latitude and a longitude, -said geographic data indexed by said single index structure are searchable for a non-spatial property of the indexed geographic data that represent the geographic features using computer-executable instructions and said third dimension of said single index structure, wherein said non-spatial property of the geographic data includes a rank associated with the geographic features represented by the geographic data, a granularity of said indexed geographic data, and a scale associated with said indexed geographic data, wherein said data that represent geographic features are organized into layers based on said rank associated with the represented features.*

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The closest prior art, NA et al (US 6,125,367), Soultis et al (US 4,873,513), Moroto et al (US 6,512,326) show similar methods for managing map data involving the maps of various scales via the formalized index structure and the hierarchical structure. However, NA et al, Soultis et al, and Moroto et al., singularly or in combination, still fail to anticipate or render the above cited limitations obvious.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Miranda Le whose telephone number is (571) 272-4112. The examiner can normally be reached on Monday through Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James K. Trujillo, can be reached at (571) 272-3677. The fax number to this Art Unit is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (571) 272-2100.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Miranda Le/
Primary Examiner, Art Unit 2159